SCHERMERHORN'S MONTHLY:

FOR

PARENTS AND TEACHERS.

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A KNOTTY QUESTION—BOTH PUZZLED.

WE never look at this picture without mingled emotions of mirth and sympathy. That stolid-looking school-master, "all of the olden time," accustomed to rule absolutely, by mere brute force, and to apply the strap or nine-thonged lash to his pupils till they roared with pain, finds himself here confronted by a problem which he is utterly incapable of solving. We can almost see his fingers tingling to use the whip, yet even his dull brain comprehends that this problem is not to be answered by whipping the diffident and thoroughly frightened little fellow who has propounded it. What shall he do? Answer it, he cannot; lay it aside, he may, for to-day, but it is sure to come up again to-morrow, and if he fails to solve it then, whip and bluster as he may, his prestige will be gone. The case is one which he did not contemplate when he completed his course in "the three R's."

And the boy! We rather like that puzzled face. There is the material for a man of mark in that boy, spite of his scared look, his tousled head, and the string carelessly hanging out of his pocket. He sees through the school-master, notwithstanding his fright, and clinches the puzzle which is slowly permeating the master's stupid brain, with the statement, "But, sir, if wanst nought be nothing, then twice nought must be something; for it's double what wanst nought is." Well reasoned, my little fellow; old stupid there can't detect the

fallacy in that proposition, though there is one; and he can't find a plausible excuse for flogging you for making it, though he would like to do so.

But let us look a little at the difficulty, for difficulty there is, which these two cannot solve; and perhaps we cannot state it better than by using, in part, the boy's words —Why shouldn't twice nought be something, seeing it is double what once nought is?

The trouble is in the old methods of notation. Our early writers on elementary arithmetic confounded in their notation three distinct systems; that of reckoning by twelves, or dozens —which in England was the oldest system of all, and seems to have been derived from the Roman mathematicians — our own decimal system, and the more complicated and abstruse method of reckoning by nines. The child was told that there were nine digits, when, if he was so fortunate as to find out what "digits" were, he could ascertain from his own hands that there were but eight, or, counting his thumbs, ten; and why one should be deemed of no account was another of the many puzzles which met him in starting on his educational career. He was told also that he must carry one for every ten, thus recognizing the decimal system indirectly, and when he came to the multiplication table every number was multiplied from one to twelve. In all this he found nothing about multiplying the cipher, but right before him, usually on the first page of the arithmetic, there were set forth in all their dignity "THE NINE DIGITS,"

1 2 3 4 5 6 7 8 9 0.

Here were ten figures instead of nine, and no explanation that the last one was different in character from any of the rest, and when called to add, subtract, multiply, or divide this last figure at the right, and informed that none of these processes had any effect upon it, he was hopelessly puzzled and confused. Yet none of the earlier arithmetic-makers seem to have comprehended where the difficulty was. The fact that the cipher is only valuable when it represents, and is the symbol of, one or more tens, seems never to have occurred to them, and instead of recognizing the fact that there were ten digits instead of nine, and that the last number in the row should be ten instead of a cipher, they meandered on, more thoroughly confused at each step of their progress.

An amusing illustration of this occurs to us just now. About forty-five years ago, a cockney Englishman left his country for his country's good. He had been detected in some transactions there which indicated that he had little regard for the rights of property, and he found it convenient to cross the Atlantic. Soon after his arrival here he commenced his career of fraud or theft anew, and was arrested, convicted, and sent to State prison. While in prison he came into possession of an English arithmetic, possibly Hind's, which was then recently published, and the brilliant idea occurred to him that he could make an Arithmetic. He accordingly went to work, and as then, as now, there was no international copyright, there was nothing to prevent his appropriating most of the English work. After his discharge from prison, he went among the publishers to find some one who would introduce his bantling to the public. At last he found a good, but not very shrewd man, who thought it might answer, and put it to press. It is not necessary to give the name of either the professed author or the publisher. Both have been dead for some years. But the publisher, at the earnest solicitation of the author, employed him to introduce the book to the schools and the public; and so it happened that, forty years ago this very centennial summer, the inhabitants of a young and prosperous manufacturing village in Massachusetts found placards posted about the streets one fine morning, to the effect that Mr. P. E. B. would address the people that evening on the subject of Arithmetic. Public lectures were not so common then as they were in after years, and although comparatively few cared much about a lecture on Arithmetic, there was a fair audience when the lecturer came upon the stage. He was a short, square-built Englishman, of the lower class, and though more flashily dressed than the school-master in our illustration (I remember that he had a scarlet necktie), he strongly resembled him in his general appearance. He made an awkward bow as he came upon the stage, and commenced his address in these words: "My respected horgetory (auditory, he probably meant), hi am 'ere to leckshure to you hon the science of harithmetic, and has hi ham the hauthor of this book (holding up a copy of his Arithmetic), hi know hall habout the subjick, and will make hit very plain to you." He then proceeded to say a few

words about "Numeration, Haddition, Subtraction, hand Multiplication;" but by this time he had reached the great point, the *piece de resistance* upon which he intended to enlighten his "respected horgetory," whom he doubtless believed to be as ignorant as himself, and thus did he commence his attack upon it: "Now, my respected horgetory, there his one subjick that hi hexpect 'as troubled you has hit did me, and that his, that the book says that nine times nothin his nothin, hand that his true, has hi will show you." Here he turned to the blackboard and commenced to cover it with figures, among which the ciphers were very prominent, talking all the time in his intensely cockney dialect, but after half an hour of figuring and shouting until he had grown very red in the face, he was no nearer the solution of his problem than when he began; and he had sense enough to perceive that he was making no headway, for he wound up his lecture with these memorable words: "Now, my respected horgetory, hi 'ave worked 'ard this last 'alf hour to prove to you that nine times nothin was nothin, hand hi don't believe that more'n 'alf hof you understand hit now." At this point some of the boys shouted "Three cheers for P. E. B.," which were given with a will, and under cover of the noise the arithmetical lecturer suddenly disappeared.

A WRITER in the *New England* coincides with the view of one of our correspondents in regard to the usefulness of newspapers. "He says: "I have found it to be a universal fact, without exception, that those scholars, of both sexes, and of all ages, who have access to newspapers at home, when compared with those who have not, are: 1. Better readers, excellent in pronunciation, and consequently read more understandingly. 2. They are better spellers, and define words with ease and accuracy. 3. They obtain practical knowledge of geography in almost half the time it requires of others, as the newspapers have made them acquainted with the location of the important places of nations, their government, and doings on the globe. 4. They are better grammarians, for, having become so familiar with every variety of style in the newspapers, from the commonplace advertisement to the finished and classical oration

of the statesman, they more readily comprehend the meaning of the text, and constantly analyze its construction with accuracy. 5. They write better compositions, using better language, containing more thoughts, more clearly and more correctly expressed. 6. Those young men who have for years been readers of newspapers are always taking the lead in debating societies, exhibiting a more extensive knowledge upon a greater variety of subjects, and expressing their views with greater fluency, clearness, and correctness."

THE WONDERS OF THE FOREST.

THE article on "Wonderful Trees" in our June number would have been much more extended, had all the wonderful growths which fertile Nature has produced been brought under review. We give below a correspondent's account of the Sacred Tree of Thibet. Gilbert Hamerton, in his "Unknown River," gives a description of some giant trees in eastern France, a portion of the world which is commonly supposed to be well cut over. Yet here the artist found a number of relics of the 'forest primeval' still flourishing, of one of which he gives this picture.

"This noble oak was in every respect one of the most perfectly and equally developed I ever met with. Sufficiently isolated for its growth not to be in the least interfered with, and yet at the same time not too much exposed to any prevailing wind, its massive column rose straight upwards, and its enormous branches spread equally in every direction. Its crown of foliage was a sylvan world resting upon a pedestal fifty feet in circumference. At some distance the tree did not strike one as particularly big, on account of its beautiful proportions and the not inconsiderable size of its neighbors, but once under the shade of the great branches, the spectator suddenly becomes aware of the weight and size, and makes deductions concerning the strength of the trunk that can support them. The whole tree is perfectly sound, and neither lightning nor human hand has ever lopped off one branch."

The "Chestnut-tree of a Hundred Horses," mentioned in the former article, had not the beautiful proportions of this king of the wood discovered by Mr. Hamerton. But it had elements of majesty nevertheless. Our cut gives a good idea

of the tree. At one time it was supposed that the tree consisted of a clump of several others united. But this is not the case, for on digging away the earth the root was found entire and at no great depth. Five enormous branches rise from the trunk, the exterior surface of each being covered with bark, while on the inside is none. The verdure and support of the tree thus depend on the outer bark alone. The intervals between the branches are of various extent, one of them being sufficient to allow two carriages to drive abreast. In the middle cavity, or what is called the hollow of

THE CHESTNUT-TREE OF A HUNDRED HORSES.

the tree, a hut has been built for the use of persons employed in collecting and preserving the fruit. They dry the chestnuts in an oven, and then make them into various conserves for sale. These chestnut-gatherers are, however, very reckless about injuring the tree, and they will pull down the branches, without any scruple, to heat their ovens. A whole caravan of men and animals was once accommodated in the inclosure, and also a flock of sheep folded there.

Of the Sacred Tree of Thibet our correspondent says: "It is often called 'The Tree of Ten Thousand Images.'" Mr. Huc, a distinguished French missionary, has given a minute description of this tree in his very entertaining book, entitled, "Travels in Tartary, Thibet, and China, in the years 1844-5-6"—a work not easily obtained in this country, except in an abridged form. I will give the account in his own words:

"We had heard of this tree too often during our journey not to feel somewhat eager to visit it. At the foot of the mountain on which the Lamasery stands, and not far from the principal Buddhist temple, is a great square inclosure, formed by brick walls. Upon entering this we were able to examine at leisure the marvelous tree, some of the branches of which had already shown themselves above the wall. Our eyes were first directed to the leaves, and we were filled with an absolute consternation of astonishment at finding that there were upon each of the leaves well-formed Thibetan characters, all of a green color, some darker, some lighter, than the leaf itself. Our first impression was a suspicion of fraud on the part of the Lamas; but after a minute examination of every detail, we could not discover the least deception. The characters all appeared to us portions of the leaf itself, equally with its veins and nerves; the position was not the same in all; in one leaf they would be at the top of the leaf; in another, in the middle; in a third, at the base, or at the side; the younger leaves represented the characters only in a state of formation. The bark of the tree and its branches, which resembles that of the plane tree, is also covered with these characters. When you remove a piece of old bark, the young bark under it exhibits the indistinct outlines of characters in a germinating state, and, what is very singular, these new characters are not unfrequently different from those which they replace. We examined everything with the closest attention, in order to detect some trace of trickery, but could discern nothing of the sort, and the perspiration absolutely trickled down our faces under the influence of the sensations which this most amazing spectacle created. Our readers possibly may smile at our ignorance; but we care not, so that the sincerity and truth of our statement be not suspected.*

The Tree of the Ten Thousand Images seemed to us of great

*[May not the characters have been taken from the leaf?--ED.]

age. Its trunk, which three men could scarcely embrace with outstretched arms, is not more than eight feet high; the branches, instead of shooting up, spread out in the shape of a plume of feathers, and are extremely bushy; few of them are dead. The leaves are always green, and the wood, which is of a reddish tint, has an exquisite odor, something like that of cinnamon. The Lamas informed us that in summer, towards the eighth moon, the tree produces large red flowers, extremely beautiful. They informed us that nowhere else exists another such tree; that many attempts have been made in various Lamaseries of Tartary and Thibet to propagate it by seeds and cuttings, but all attempts have been fruitless."

THE EDUCATIONAL SHOW AT PHILADELPHIA.

OF the educational displays at Philadelphia, the largest is that of the State of Pennsylvania, which occupies a fine octagonal building, represented in the engraving opposite. In the center of this building is an assembly-room forty-eight feet in diameter, which is devoted to school furniture and

SWEDISH SCHOOL-HOUSE.

apparatus. Surrounding this room are alcoves in which are shown the specimens of work done in schools of various grades and classes. Kindergartens, common and district schools, academies, seminaries, normal schools, colleges, and charitable schools for the blind and feeble-minded are all represented. There are two wings to the building, used for offices and committee rooms.

Foreign nations have generally put their educational exhibits in the main building. Sweden, however, is an exception, and her display is the most complete of them all. The Swedish school-house, of which we give an illustration, was built of material brought from Sweden. It looks very little like an ordinary country school-house in America, and is a good model for those who wish a building that shall have not only "all the conveniences," but also an attractive appearance. It looks less like a shop and more like a home than most school-houses. A school-room is fitted up in the northern end. The desks are made of a light-colored wood, but are not so neatly finished as we are accustomed to see them. The

PENNSYLVANIA EDUCATIONAL BUILDING.

back of the seat consists of a single upright, about twelve inches wide, and just high enough to support the shoulders. It is placed about midway of the seat, which is evidently intended to hold but one pupil. The style of this back is entirely different from any in use here. All the various appurtenances of the school-room are at hand, including many pieces of philosophical apparatus. A handsome school organ is shown, as music is regularly taught in all Swedish schools. There are some very fine botanical collections, botany being a favorite branch of instruction in that country.

The display made by Switzerland is exceedingly interesting, and includes among other things a quantity of specimens sent by the School for the Improvement of Artisans; also

photographic views of school interiors, and a collection of books describing the working of the inter-state government, as bearing upon the practical problems of education. We hope many of our readers will visit the Educational Department of the Exhibition, and see for themselves what it is impossible adequately to describe. Words and figures cannot make the impression that is conveyed by the actual sight of these collections. A California teacher lately came into our office, and declared that in spending four days in only a small part of the Foreign Educational Department, she had not begun to exhaust the interest and the novelty of the array. Whatever one can gain of stimulus by such a visit is not to be estimated by its value as entertainment simply; for it becomes a permanent addition to one's working force, a sort of generator of energy for a lifetime.

AT WHAT AGE SHALL EDUCATION BEGIN?

THE training of the mental powers is not wholly dependent upon the formal efforts at teaching that are made either at home or at school. The brain of a child must of necessity be active from the moment that he comes into this world of wonders. New impressions crowd upon him every hour. Problems are presented to his undeveloped faculties which tax them to the utmost. His knowledge of language being small, he is unable to gain from others an adequate solution of many difficulties. He must work out much for himself, and in doing so he is submitting to a course of discipline quite as severe as the later discipline of the school.

If parents oftener realized this, they would be less impatient for the school-life to begin. The stimulus provided by an infant's strange surroundings does not need the addition of artificial incitements. Nature is a better guide than any other pedagogue, and she prompts the child to overwhelm its parents with questions. The facts that lie nearest to every-day life are the first that should be made familiar, and these are those that first awaken his curiosity. He has no call as yet for the multiplication table. Let him exhaust the unwritten catalogue of the house, of his father's shop, of the meadow-lot and brook, before he is introduced to the alphabet and the spelling-book.

The time is not lost during which he is observing the qualities and relations of the thousand material objects about him, even though an abstract idea do not enter his head until he is ten years old. The more extensive and minute his concrete information, the broader is the foundation for the building up of his reasoning powers, when once the process has begun. In fact, the longer this process is deferred, within obvious limitations, the more rapid will be its progress, in most cases.

The wisdom of the Kindergarten method lies largely in this, that it occupies the mind of the young child with thoughts belonging to its stage of development. It excludes those abstract reasonings which are natural to maturer minds, and which, in our forgetfulness, we are prone to thrust upon our children prematurely. And if the Kindergarten rendered no other service, it would be abundantly justified by this saving of the four-year-olds from the deforming and forcing influences of what we call primary education.

The great practical obstacle in the way of judicious management in early education is the relief desired by many mothers, who find the care of young children, through every hour of the day, inconsistent with the proper discharge of other household duties. We have heard women assent to the suggestions above recited, who in the next breath would say, "But I cannot have Georgey and Susan about all day; so I send them to school and get a chance to do my sewing and get the dinner." Far better would it be if a number of such mothers would hire a suitable person to take charge of their little ones three hours a day, with the express understanding that she should *not* teach, except to answer their questions, and to make them quite familiar with external objects. Alphabets, and all the material of the school-room, should be excluded. Activity, such as all healthy children naturally delight in, should be the rule and method of the place. The "gifts" of the Kindergarten could be introduced with profit, even if the system were not exclusively adopted. We believe that such an arrangement would produce better results than the present one, of turning children into a school unfit for them in order to escape the burden of continuous care.

There is another consideration which should have very great weight with parents, the relation of early training to physical

health. Far better were it to "neglect" a child's education for several years, if by that means he should be led to fortify his constitution by superabundant exercise in the open air, and by conforming, first of all, to the laws of hygiene. That a sound body is one of the conditions of a sound mind is generally admitted, but few understand how entirely dependent the brain is, for healthy action, on the rest of the physical organism. Far rather would we risk a child's chance of happiness and usefulness by postponing his school studies until he was ten years old, and prescribing for him only a moderate devotion to books for several years thereafter, than by shutting him up to study at four or five, and allowing him thenceforth no other physical activity than such as he could secure out of school-hours. We do not suppose that so long a postponement would often be necessary, but parents should carefully study the physical conditions that surround their children, and maintain the wisest course, at whatever sacrifice. They will be more than repaid for any temporary disappointment of their fond ambitions by the subsequent vigor of the child's mental pursuits. Sustained activity can only come when there is a reserve force, but reserve force can only be accumulated when the methods of Nature are followed, and the energies which are to be exercised in after life are developed in due order and proportion.

To answer the question at the head of this article categorically would be foolish. There is no department where the proverb, "circumstances alter cases," is more inflexibly true than in that of education. But it is safe to say that the majority of parents are in too much haste to have their children begin book-study, and that maternal convenience and paternal pride should be set aside in favor of the absolute requirements of true mental development.

Of all producers of so-called mysterious sounds, Dr. Tyndall's sensitive or *vowel flame* is one of the most curious. Out of a particular kind of gas, with a burner of peculiar construction, the Professor produces a lighted jet of flame nearly two feet in height, extremely narrow, and so exquisitely sensitive to sounds that it sings and dances up and down in response to everything that is sung or said, with different

degrees of sensibility for different vowel sounds. "The slightest tap on a distant anvil reduces its height to seven inches. When a bunch of keys is shaken, the flame is violently agitated, and emits a loud roar. The dropping of a sixpence into a hand already containing coin, at a distance of twenty yards, knocks the flame down. It is not possible to walk across the floor without agitating the flame. The creaking of boots sets it in violent commotion. The crumpling or tearing of paper, or the rustle of a silk dress, does the same. It is startled by the patter of a rain-drop. The twittering of a distant sparrow shrieks in the flame; the note of a cricket would do the same. A chirrup from a distance of thirty yards causes it to fall and roar."

HOW TO TEACH ELEMENTARY SCIENCE.

BOTANY.*

AS a science of observation, botany has a decided advantage over zoology, especially for educational purposes, inasmuch as the objects of which it treats are examined, dissected, and analyzed with more facility. They also possess more obvious beauty, and are devoid of the repulsiveness which attaches to so many objects of the animal kingdom. An insect, apparently disgusting at the first view, when closely examined, often shows more beautiful properties and more striking evidences of design than the most elegant blossom; but the natural aversion to handle it, or come in contact with it, must first be overcome.

The *classification* of plants, being based upon distinctions often very minute, must, for the purposes designed to be accomplished in these simple lessons, be carefully limited. Only common plants need to be classified. The limitations of the classification to be taught are indicated below.

The first *few* lessons should show the *structure* of plants and the general functions of each of their parts—the *root*, the *stem*, the *leaf*, the *flower*, the *seed;* the *growth* of the plant from the seed, both as to root and stem; the food of plants; buds and branches—how a plant grows from them; the distinction be-

* From How to Teach, by Henry Kiddle, Supt. of Public Instruction, Thos. F. Harrison, First Asst. Supt. Grammar Schools, and N. A. Calkins, First Assistant Primary Schools, New York City.

tween *herbs*, *shrubs*, and *trees;* also between *annuals*, *biennials*, and *perennials*. Examples of each to be given.

Classification of leaves—a beautiful and very useful department of the subject, especially as a means of training the powers of observation—may then be taught, the children being encouraged to gather specimens for careful scrutiny. The vocabulary employed to indicate the peculiarities is very interesting and will serve to teach something of etymology—as *ovate*, *cordate*, *palmate*, *digitate*, *serrate*, etc., etc. Give the pupils *formulæ* for methodical examination and description.

Classification of roots and stems, to be taught in a similar manner, but much more briefly. Next, that of *blossoms*. First, show the parts of a blossom, taking a regular one to begin with —as of a *lily*, a *morning-glory*, or a *butter-cup*. Analyze so that the pupils can see the parts, showing the *calyx* and *sepals*, the *corolla* and *petals*, the *stamens* and the *pistil*, *with its ovary*. Give a sufficient number of exercises to make this familiar, and let the pupils analyze for themselves. The *principal forms* of flowers, as *bell-shaped*, *wheel-shaped*, *salver-shaped*, *cross-shaped*, *butter-shaped*, etc., etc., may then be shown. The *arrangement* of the blossoms on the stem (inflorescence), as far as it can be exemplified by actual specimens, as *head*, *raceme*, *spike*, *umbel*, etc., may also be learned.

The following outline of classification may be taught:—

A (Series). Flowering (*phænogamous*) plants.

B (Series). Flowerless (*cryptogamous*) plants.

At first use only the *familiar* terms. The scientific may often be dispensed with entirely. Give examples of plants in each series; as—*rose*, *lily*, *geranium; fern*, *moss*, *mushroom*.

A, including *a* (class). Outside-growing (*exogenous*) plants.
b (class). Inside-growing (*endogenous*) plants.

Illustrate by *stems*, showing the rings or annual layers of growth in the former, with *bark*, *wood*, and *pith*, and their absence in the latter. Teach the coincident peculiarities of the leaves, as *netted-veined* and *parallel-veined*, affording a ready method (approximate) of distinguishing these plants, and thus giving opportunity for useful exercises; also those of the seeds, as of two seed leaves (*cotyledons*) or only one (*dicotyledonous* and *monocotyledonous*).

Familiar examples to be found by the pupils; such as rose.

buttercup, geranium, pea, potato, grape-vine, etc., etc., and lily, Indian corn, common grass, etc.

(*a*) Including, 1. Orders or families of plants with blossoms of many petals (*polypetalous*); and, 2. Orders or families of those with blossoms of one petal (*monopetalous*). The pupils will readily find specimens of each, the names of which they have already learned.

The orders of (*b*) should not be taught. Nor need any instruction be given in relation to the classification of cryptogamous plants, *ferns*, *mosses*, etc., this being too difficult, and depending upon distinctions not sufficiently obvious for the purpose of these lessons. Attention, however, may, if occasion offers, be called to the *fructification* of ferns.

Such of the *orders* or *families* should be taught as are very familiar, and depend upon quite obvious distinctions, familiar names being exclusively used. Thus, the *Mustard Family*, the *Pulse Family*, the *Crowfoot Family*, the *Rose Family*, the *Lily Family*, etc., etc., may be taught as far as the collection and presentation of specimens render it desirable; that is, not the mere fact that there are such families, but in connection with an actual object, and when the *inquiry* is, To what family does it belong? If the season permits, and there is an opportunity for the pupils to seek for specimens, this part of the instruction may be extended. Here the judgment of the teacher (never to be superseded) must be carefully exercised, it being constantly in view that the object of these lessons is not to make the pupils *botanists*, but to create a basis for the study of natural objects, and to develop the faculties of perception and reflection. *Species* need not be taught, although the pupils may, as occasion offers, be made to perceive the diversity presented by different individuals of the same family, so as to learn what is meant by species.

The *common uses of plants* may be taught to some extent incidentally with some of the above instruction, but more fully at this stage. This will embrace their uses for *food*, *clothing*, *medicine*, etc. Take our own plants first. Show that the *roots* of some plants are useful; of others, the *seeds;* others, the *leaves;* others, the *fruit;* others, the *bark*, etc. Some few plants of other climates and countries may then be referred to, as *cotton*, *rice*, *sugar*, *tea*, *coffee*, etc., etc. The relationship of these

plants to our own may then be shown; that is, the *families* to which they belong.

MINERALOGY.

This subject presents some peculiar advantages for attaining the special object of oral instruction—the discipline of the observing faculties. In no other department of natural science is it so completely within the power of the teacher to present the facts to be acquired to the immediate perception of the pupils in the class-room, and in no other is more delicacy of discrimination required in the exercise of the senses upon which the perceptions are based. But while the *objective method* is thus seen to be peculiarly applicable to this branch of science, it must, at the same time, be remembered that no other subject, perhaps, requires so large a share of *imparted information.* This, however, should be given not arbitrarily, but as something needed to supplement the knowledge gained by the pupil in the exercise of his own faculties, and, as far as possible, in answer to his inquiries, the determination of the mind to *self-activity* being the great *desideratum* in this kind of teaching; hence, the important principle should be kept steadily in view that nothing should be done for the pupil which he can be made to do for himself.

The teacher should also bear in mind that it is utterly impossible to teach the subject without *special preparation* for it—without being practically familiar with at least the outline facts of the science. This preparation may readily be made with the assistance of even a small cabinet of minerals, properly labeled (*Day's Grammar School Cabinet*, for example), and any of the smaller manuals of Mineralogy (Dana's, for instance).

What has been said in the preceding grade, as to the propriety or necessity of attempting only a part of the subject, is equally applicable here. What is done should, however, be systematic—not miscellaneous and unrelated. Do not attempt to treat any of the topics exhaustively. A large part would not be understood or remembered, and valuable time would be misapplied.

The investigations made by the pupils in relation to each mineral should be guided by the teacher by means of a regular formula, considering in a fixed order its *form, structure, cleavage, fracture, hardness, weight, color, luster, etc., etc.* These special characteristics and their proper order will be readily

remembered after a little practice. Each term thus used should be carefully illustrated and explained as soon as its introduction becomes necessary.

Begin with *Minerals—Rocks* to be afterwards considered as mineral aggregates. A clear conception of the general properties of minerals may readily be given by commencing with ice —water—steam.

As a preparatory step, lead the pupil to form some definite idea of the variety of forms of crystals, by briefly comparing coarse salt, alum, borax, quartz, mica, rock-candy, etc. Use only the term *crystal, without* giving the *names* of substances.

In treating of ice, draw attention, not by telling, but by proper questioning, to its transparency, color, luster, weight, solidity, hardness, fracture, and to the needle-like crystals which can be so readily shown in ice-films when water begins to freeze, and in the frost-flowers on the window-pane. Lead him now to see that a block of ice, or a snow-bank, must be made up entirely of such crystals, even though their individual forms are no longer perceptible. Show next that many other fluid substances, like water, upon losing their heat, crystallize into definite solid forms, under favorable conditions, as in melted sulphur, and in the beautiful zinc crystals which cover the surface of so-called galvanized iron. Dwell somewhat upon these phenomena of crystallization, and draw attention to the mysterious and indestructible force which somehow rebuilds the atoms of the water into the same forms, no matter how often the ice may be melted.

The next step in this preliminary lesson will be to show that crystals may also be formed from substances in solution. Alum, salt, borax, etc., will furnish ready means of illustration. Lead the pupil further to notice, that, as in the case of the ice, so with the sulphur, zinc, alum, etc., the crystals may become so massed as to be no longer individually distinguishable.

The principal points to be fixed in such a lesson are that there are many kinds of crystals, some formed from liquids which have become solid by a loss of heat, and others deposited from solution. These facts will be found of great importance in further treating the subject.

The pupil is then prepared to compare ice with a *quartz crystal,* which should be presented but *not at first named,* and should

be compared first as to the resemblances, then the differences. When the pupils can be made to furnish no more ideas, the teacher should state where it is found, its relative abundance, geological importance, economic uses, etc., etc. Be particular *not to introduce* an unexplained term—such as the *name* of any rock or mineral, as gneiss or gypsum. The name means nothing until explained as quartz has been. Other forms of quartz may then follow, each treated in the same way, and each in its turn compared with those that have preceded it. This will constitute an excellent review, and will thoroughly fix what has been already taught. Encourage the pupils to look for and bring in specimens which they think to be of the same character as those studied. *Let them tell* why they think they are the same. *Let others tell* why they think they are not.

Having thus treated of *quartz*, next consider in the same way *feldspar* and *mica*. The pupils will now be ready to consider a *rock*. Let it be gneiss or granite. Let the pupils look for the minerals in it (a cheap single lens as a magnifier will often be of service). Then consider the texture, structure, where found, uses, etc. The mineral *hornblende* and its important varieties may then follow, and after that the rock *syenite*. All needful information may be obtained from any of the manuals in use.

It will not be necessary here to follow out in detail all the minerals and rocks of which it is desirable that pupils should have some knowledge. A list of the more important, mostly from Dana, is subjoined, from which the teacher can make such selections as will conform essentially to the above plan.

MINERALS.

Water; carbon, diamond, coal and coal-mining, anthracite, bituminous, jet, plumbago, amber, petroleum, asphalt; sulphur; saltpeter, salt, borax; lime, gypsum, alabaster, selenite, calcite spar, chalk, stalagmites, lime-stones (crystalline and compact), marbles, quicklime, hydraulic lime, dolomite; alum; talc, soapstone (French chalk), meerschaum, pyroxene and hornblende, corundum and emery, feldspar, albite, orthoclase, garnet, mica.

METALS.

Mineralized (ores) or native.—Ores of tin, iron, nickel, zinc, lead, mercury, copper, gold, silver, platinum. Enter into no *details* of Metallurgy; a few simple facts in regard to smelt-

ing, fluxes, etc., will not be out of place. The economic uses of these metals and the poisonous properties of some of them should receive very careful attention.

ROCKS.

As single minerals—example, pure lime-stone. As compounds—granite or conglomerate. Rocks as crystalline and uncrystalline, stratified and unstratified, aqueous, igneous, and metamorphic.

The relative position of important rocks—granite, syenite, gneiss, mica-slate, steatite, trap, basalt, lava, pumice, slate, shale, schist, quartz-rock, burr-stone, sand-stones, grits, conglomerates, limestones, marble, sand, clay.

Such of these rocks as are found in the vicinity of the school, or are frequently seen by the pupils when used for paving, flagging, building, etc., should receive particular attention.

TWO PICTURES.

AN old farm-house with meadows wide,
And sweet with clover on each side;
A bright-eyed boy who looks from out
The door, with woodbine wreathed about,
And wishes his one thought all day:
"Oh! if I could but fly away
From this dull spot the world to see,
How happy, happy, happy,
How happy I would be!"

Amid the city's constant din,
A man who round the world has been
Is thinking, thinking all day long;
"Oh! could I only trace once more
The field-path to the farm-house door,
The old green meadows could I see,
How happy, happy, happy,
How happy I would be!"

WHERE DO YOU PLACE THE EMPHASIS?—John Henry, reading to his wife from a newspaper: "'There is not a single woman in the House of Correction.' There, you see, don't you, what wicked creatures wives are? Every woman in that jail is married." "It is curious," said she; "but don't you think, John, dear, that some of them go there for relief?"

HABITS OF SLEEP.

IT is the custom with many persons to neglect all systematic regulation of the hours and conditions of sleep, while very many others systematically interfere with the demands of nature in regard to physical rest. The former class spend such time in bed as may not be absorbed by their various occupations, and pay no attention to the body's want of repose except when they "feel sleepy" or have nothing to tempt them to sit up beyond the usual hour for retiring. A party, a new book, an unfinished piece of work will readily induce them to protract the waking period into the "wee, small" hours, and they doze or rise in the morning according to the exigencies of their plans for the day. The latter class proceed on the theory embodied in the rhyme, so unwelcome to childhood's ears—

> "Early to bed and early to rise
> Make a man healthy, wealthy, and wise;"

and make it a rule to be up and doing at a specified early hour, even if the drowsy senses have to be violently roused in order to maintain it.

The habits of sleep have so important a bearing upon physical health and vigor, that it is worth while for parents to give them more consideration than is usually bestowed upon them. It is a fatal mistake to allow anything to abridge the amount of sleep required by growing children. During childhood and youth the constitution should be built up and fortified for the inevitable wear and tear of maturer life. All the sound sleep that can be regularly secured contributes to the great reserve fund of vitality. It is hardly possible for the boy or girl who takes daily open air exercise in fair measure to sleep too much. Time should be secured in two ways: by a quiet evening closed by reasonably early retiring, and by non-interference with the natural demands of the body in the morning. It is a custom very injurious to health which permits young people to join their elders on exciting social occasions after eight o'clock. Not only the late bedtime, often near midnight, but the agitation of the nerves and the untimely activity of the brain are inseparable from this thoughtless indulgence. Often sleep does not begin until long after the immediate occasion of the excitement has passed, and when it does come it is troubled and broken. The

same injury is often wrought by evening study. We have no hesitation in saying that the last waking hour should never be given to study, but to some quieting occupation which shall be favorable to a quick "dropping off" when the head is laid upon the pillow. This is a good rule for everybody, and if adopted universally, would add immensely to the general power of endurance and accomplishment. But for children it is an absolute condition of healthy growth. The seeds of many nervous diseases in mature life have been sown in youth by habits of mental activity after eight o'clock.

The hour of rising should not be fixed. We know that this will seem a hard saying to thrifty housekeepers. Breakfast at an early hour is deemed one of the essential points of good management. We do not dispute this, nor forget that circumstances in many families require that the morning meal should not be late. It is not necessary that it should be. If the general suggestions about retiring given above are followed, the children will seldom fail to be on hand at the breakfast table. But if nature calls for extra sleep, her voice should not be drowned by a bell or a peremptory summons to get up. There is no danger of lazy habits being formed when a child is well, and goes to bed at the proper time in a quiet frame of mind.

The individual constitution of every child must also be studied in regard to habits of sleep. Some cannot easily fall asleep, or are easily waked in the night; some cannot rise at once on waking without inducing headache or palpitation, and some cannot do any kind of work before breakfast without injury. Sleeping with another proves detrimental to not a few, and if it were practicable, doubtless all would be benefited by having separate beds. In every case, however, the thorough ventilation of bedrooms is indispensable to health. Many a consumptive is the victim of a constitution enfeebled by a long period of nightly confinement in impure air. Better put your child to sleep in a shed than in the tightly closed chamber where he must breathe over the gas which his lungs have rejected during the first hour of repose.

The influence of regularity in habits of sleep can hardly be overrated. It does not avail to observe healthful conditions five nights out of seven only, with the expectation that two weekly departures from the wiser plan will make but little dif-

ference. The two evenings of excitement and late hours will disturb the system and prevent sound sleep on other nights than those invaded by the irregularity. The child's constitution is sensitive and easily overstrained, and though damage done to it may be hidden, it will appear in the disabilities of later life.

It should be added, in behalf of those children whose homes are in our large cities, that six o'clock dinners are unfavorable to sound and early sleep. It may be a choice of evils for the busy merchant to defer his chief meal until he can take time to digest it, but his children should not be obliged to follow his example. In this, as in all family arrangements, the parents' first care should be to give their children health; wealth and wisdom will then follow not very far off. H.

THE NEED OF INDUSTRIAL EDUCATION.

THE multiplication of industrial schools is looked upon with disfavor by many adherents of the present system of higher education. Notwithstanding the loud popular demand for practical training, these educators insist that mental discipline should be the chief, if not the only object of a course of advanced instruction, and that the time devoted to manual practice in any of the arts is so much lost for the purposes of development. It is also plausibly argued that the concentration of the pupils' minds upon industrial preparation has a narrowing influence, and furnishes superfluous stimulus to the desire to make money.

Opposed to this view is the common opinion that the best part of education is that which enables a person to get a living, to be useful as a worker and a citizen. The question, What do you expect to be when you grow to be a man? is pressed upon children at an early age, and when they have become acquainted with those elementary branches which are the tools common to every occupation, they are, in a majority of instances, incited to acquire such knowledge as may help them in their special careers. This is called the practical, common-sense view, and so strong a hold has it upon the popular intelligence, that it may well be doubted if the strongest

arguments in favor of discipline and culture, or even the social pressure which attracts so many to professional life, will ever overshadow it. We even find that very many students in our colleges, and not a few of the older alumni, contend that every grade of instruction should be principally directed to utilitarian ends.

The facts advanced in support of these opposing theories are mainly the following: The advocates of disciplinary courses of instruction point to the immense services rendered to the world by educated men. Who have generally been the leaders in legislation, in scientific discovery, in social life, in great executive enterprises? Who have done most to abate hurtful popular prejudices, to instigate reforms in Church and State, to extend to the million the privileges once possessed by the few alone? Granting that all-important and permanent changes have depended upon the will of the uneducated masses, still, let us ask, Who have persuaded and controlled these masses in the interests of progress? There is but one answer to these questions. The strengthening and liberalizing effect of mental discipline has been absolutely demonstrated. It is a part of undisputed history. And we may add that, on the whole, the higher education has tempered the despotism of avarice, by refining the ambitions of men, and has softened the intolerance, political and religious, which marked the ancient civilizations. These results have obtained in proportion to the widening of facilities for acquiring advanced knowledge. And the friends of the college and university claim that these benefits should be still further extended to embrace as large a part of the population as possible.

But there is another array of facts which seem to conflict with these. As the roll of college graduates will show, a considerable portion of them are only nominally educated, not disciplined men. They have not taken more than a superficial polish. They display no vigor, no adaptation, in the discharge of life's responsibilities. The "practical man," without education, outbids them in accomplishment of all sorts. Too many of them become chronic theorizers, builders of air castles, riders of hobbies. Not a few are unable to turn an honest penny in season to supply their personal wants. Another fact to be considered is the narrowing effect produced upon

this class of minds by the associations of university life. Instead of being liberalized in his sentiments, many a youth of humble birth merely exchanges one set of prejudices for another. While poor and ignorant, he shared that graceless dislike of his superiors that belongs to ignorance. Elevated to a higher caste, he disdains fellowship and sympathy with all who are not graduates of college. He condemns manual labor. He treats the mechanic with condescension, the farmer with superciliousness. The merchant he tolerates, but does not admire. He must be a lawyer, a journalist, a minister, a physician, or at least a teacher; it would degrade him, he thinks, to go back to farm or shop, and succeed to his father's homely toil. The disciplined mind that he is supposed to possess cannot bring itself to the contemplation of material things. Ideas are his only ambition. He will become famous if he can, barely successful if he must, but never, never an artisan, a handler of base matter. He is, moreover, encouraged in this narrow view by Mrs. Grundy, who, though she is by no means unready to bestow honor upon merchants and manufacturers who have reached a position where they may oversee manual workers, is very careful to avoid all who have a trace of soil on their palms. She spurns a man who earns a respectable income "with his hands," but welcomes to her parlor the man who is too poor a lawyer, preacher, or physician to support his family. It was this incompetent professional person who used to excite the contempt of Horace Greeley, and led him to declare against college education.

The attempt to combine discipline and industrial preparation is one of the results of the partial failure of the colleges to supply the world with successful workers. We must have men of wide information, of well-regulated minds, who are also thoroughly competent in affairs. Our educated men must be able to earn a living, and they must understand the practical wants of the time. No amount of mental discipline that unfits them for adapting themselves to shifting necessities is a benefit to society. If a youth spends ten years and a good share of his father's personal property upon his education, and then turns out to be only a fourth-class minister whom nobody wishes to hear preach, and whom it is mere charity to support, and if he cannot put his hand to anything, is not that paying

too dear for the whistle? He may have a natural aptness for the handling of tools, but he has neither the practice nor the ductility of mind that would qualify him to use them. He must fight the battle where he is, at whatever disadvantage, for to change his base is to contradict the settled maxims of his "liberal education."

That bit of ancient wisdom which prescribed for every youth a trade, no matter what his further education or employment, is sometimes praised in our day, but very seldom put to proof. We concede that it is a good thing to have more than one string to one's bow, but we do not provide more. There is, indeed, a great deal of ignorant experimenting by educated men in fields more or less foreign to their professional training. "Jacks of all trades" abound, but their proficiency does not keep pace with their ambition. Their industry does not supply the want of technical education. They are too impatient to learn slowly and thoroughly, "boy fashion," and they assume that mature judgment will supply the place of constant practice. Only a sudden and great success would seem to compensate them for abandoning a "profession" for a business which they do not profess to have learned, but only to have "picked up." How much more self-respecting and thorough might they be, if in youth they had disciplined not only their minds but also their eyes and fingers, and had become so accustomed to the work-bench that it would imply for them no false humiliation! In these times, when competition is so great in the professions, and when the number of educated tramps is a fearfully increasing burden to the productive industries of the country, would it not be well rather to encourage the industrial schools and to hold them at least in equal honor with our colleges? L.

THE RESOURCES OF LIFE.—The object is to give to children resources that will endure as long as life endures—habits that time will ameliorate, not destroy—occupations that will render sickness tolerable, solitude pleasant, age venerable, life more dignified and useful, and, therefore, death less terrible.

> "A rusty nail, placed near the faithful compass,
> Will sway it from the truth, and wreck the argosy."
>
> —*Scott.*

UNBREAKABLE OR TOUGHENED GLASS.

A CONSIDERABLE degree of well-merited attention has of late been directed toward an invention which may be justly termed remarkable even in these days of startling discoveries, inasmuch as it is one which promises to effect a complete change in the physical character of glass. This invention is the toughening process of M. François Royer de la Bastie, by which the natural brittleness of ordinary glass is exchanged for a condition of extreme toughness and durability. And this invention is perhaps the more remarkable in that it does not emanate from one practically conversant with the manufacture of glass, nor is it due to one of the great lights of science. On the contrary, M. de la Bastie is a French private gentleman of fortune, who was educated as an engineer, but whose position and means rendered it unnecessary for him to follow his profession. He is fond of experimenting in matters relating to engineering, and amongst other things he, some years since, conceived the idea of rendering glass less susceptible to fracture, either from blows or from rapid alternations of heat and cold. His early training naturally led him to look to mechanical means for the acomplishment of this end. He thought — as did Sir Joseph Whitworth with regard to steel — that by submitting glass when in a soft or fluid condition to a great compressive power, he should force its molecules closer together, and, by thus rendering the mass more compact, the strength and solidity of the material would be greatly increased. This was not an unreasonable line of argument, inasmuch as the fragility of glass results from the weakness of the cohesion of its molecules. But success did not follow experiment, and the mechanical problem was laid aside unsolved.

M. de la Bastie continued to regard the question from an engineering point of view, and turned his attention to another method of treatment. Aware that the tenacity of steel was increased, and that a considerable degree of toughness was imparted to it by dipping it, while hot, into heated oil, he experimented with glass in a similar manner. The results were sufficiently successful to encourage him to persevere in this direction, and, by degrees, to add other fatty constituents to the oil bath. Improved results were the consequence; and they con-

tinued to improve, until at length, after several years of patient research and experiment, De la Bastie succeeded -- with a bath consisting of a mixture of oils, wax, tallow, resin, and other similar ingredients — in producing a number of samples of glass which were practically unbreakable. As may be supposed, there were other conditions upon which success depended beside the character and proportions of the ingredients constituting the bath. M. de la Bastie, not being a glass manufacturer, purchased sheets of glass, as well as glass articles, which he heated in a furnace or oven to a certain temperature, and transferred to an oleaginous bath, which was also heated to a given temperature. These questions of relative temperature, therefore, had to be worked out; and De la Bastie had further to determine, very precisely, the condition of the glass most favorable for the proper action of the bath upon it. This he found to be that point at which softness or malleability commences, the molecules being then capable of closing suddenly together, thus condensing the material when plunged into a liquid at a somewhat lower temperature than itself, and inclosing some portion of the constituents of the bath in its opened and susceptible pores. Having determined all these conditions, and constructed apparatus, M. de la Bastie was enabled to take ordinary glass articles, and pieces of sheet glass, and to toughen them so that they bore an incredible amount of throwing about and hammering, without breaking. Just, however, as he had perfected his invention, he lost the clue to success, and for two years was foiled in every attempt to regain it. Nevertheless he labored on, and at the end of the period above mentioned, his toils were requited by the re-discovery of his secret. He has since worked at it most assiduously, and has now brought it into practical working order, rendering the process as certain of success as any in use in the arts and manufactures of the present day.

As already observed, M. de la Bastie is not a glass manufacturer; he therefore had to re-heat glass articles when toughening them. It, however, by no means follows that the toughening process cannot be applied in the course of manufacture, thus avoiding re-heating. On the contrary, it not only can be, but has been, applied at glass-works to glass just made, and so saves the costly and time-absorbing process of annealing.

Glass which has been treated in this manner undergoes a physical transformation as complete as it is remarkable. Its appearance is in no way altered, either as regards transparency or color — if colored glass be so treated — and its ring or sound is not in any way affected. It has, however, exchanged its distinguishing characteristic of extreme brittleness for a degree of toughness and elasticity which enables it to bear the impact of heavy falling weights and smart blows without the least injury. A great number of experiments have been made, the results of which fully corroborate this fact. From these it will suffice to select a few by way of illustration. Watch-glasses, which perfectly retain their transparency, have resisted every attempt to break them by crushing between the fingers, or by throwing them about indiscriminately on the bare floor. Glass plates, dishes, colored lantern-glasses, and the like have been similarly thrown about by the handful, stood upon, and otherwise maltreated, but without the slightest injury, except when a solitary specimen which had been imperfectly tempered got in with the rest. Experiments have also been carried out to ascertain the comparative strength of toughened and untoughened glass when submitted to bending stress. A number of pieces of glass, each measuring six inches in length by five inches in breadth, and having a thickness of about a quarter of an inch, were tried. Each sample in its turn was supported at the ends, and a stirrup-piece was hung upon the center of the glass, a weight-rod hanging vertically from the under side of the stirrup. With this arrangement applied to a piece of ordinary glass, the weight-rod was gradually loaded until a weight of 279 lbs. was reached, when the glass broke. A piece of toughened glass of similar dimensions, similarly treated, did not give way until a strain of 1,348 lbs. had been reached, and before it yielded a considerable deflection was produced in it, showing its elasticity.

Satisfactory as the above results may appear at the first glance, they will be seen upon reflection most inadequately to represent the relative strength of toughened and untoughened glass. It will be observed that the test applied was that of long-sustained and gradually increasing pressure, which could rarely occur to glass articles in every-day use. Glass is subject to sudden, sharp blows; hence it is clear that to obtain a true

estimate of the new process glass must be subjected to tests which fairly represent the conditions of the accidents to which it is ordinarily exposed. This estimate has been arrived at repeatedly by placing pieces of plate glass in a frame and allowing weights to fall on them from given heights. One experiment from a number — and which was made publicly — will illustrate this test. A piece of ordinary glass six inches long by five inches wide and a quarter of an inch thick was placed in a small frame which supported the glass around its edges, and kept its under side about half an inch from the floor. A four-ounce weight was dropped on it from a height of one foot, and the glass was broken. A piece of toughened glass of corresponding dimensions was then placed in the frame and the same weight dropped on it several times from a height of ten feet, but without fracturing the glass. An eight-ounce weight was then substituted, and repeatedly dropped on the glass from the same height as before, and with the same result, no impression whatever being made upon it. The eight-ounce weight was then thrown violently upon it several times, but without damaging it. Its destruction was finally accomplished by means of a hammer. Perhaps the most crucial test to which toughened glass could be put would be to let it fall on iron. This has been done, and in public too. A thin glass plate was dropped from a height of four feet on to an iron grating, from which it rebounded about a foot, sustaining no injury whatever.

As singular as any other feature presented by toughened glass are the results of its destruction. Ordinary glass, upon being fractured, gives long needle-shaped and angular fragments. Not so toughened glass, which is instantaneously resolved into mere atoms. The whole mass is at once disintegrated into innumerable pieces, ranging in size from a pin's point to an eighth of an inch in diameter. It sometimes occurs that pieces measuring half an inch or an inch across may remain whole, but these pieces are traversed in all directions by a network of fine lines of fracture, and with the fingers are easily reduced to fragments. Microscopical examination shows the fragments of toughened glass — large and small — to follow the same law as regards the form and character of the crystals, and on some of the larger crystals being broken up they have

been found to separate into smaller ones of the same character. The edges of these fragments, too, are more or less smooth, instead of being jagged and serrated as are those of fragments of ordinary glass. Hence a diminished tendency in the former to cause incised flesh wounds when handled.

Such, then, is De la Bastie's toughened glass, which possesses enormous cohesive power, and offers great resistance to the force of impact. There is, however, one peculiarity which, for the present, tells against it in a slight degree — it cannot be cut through with a diamond. Scratched its surface can be, but there the action of the diamond ceases. This drawback only applies in the case of window-glass in odd-sized frames; for the practice of the present day, with builders, is to make window-sashes of certain fixed dimensions, and glass manufacturers work to these dimensions. It is not at all improbable, however, that ere long a means will be devised for cutting toughened glass to any size or shape; experiments are, in fact, now being conducted with this view, and so far as they have gone they give promise of success. But if toughened glass cannot be cut by the diamond, it can be readily cut and polished by the wheel, as for lusters and the like, so that wine-glasses and articles of cut-glass ware can be toughened directly they are made, and cut and polished subsequently.

M. de la Bastie's invention marks a distinct era in the history of one of our most important industries. Never, during the history of glass manufacture, which extends over some three thousand five hundred years, has any radical change been effected in its character. The glass-blowers of Egypt, who practiced their art before the exodus of the children of Israel, and representations of whom have been found on monuments as ancient as that event, produced a similar glass to that of our own times. This has been proved by an examination of glass ornaments which have been discovered in tombs as ancient as the days of Moses. It has been proved, too, by a large bead of glass, found at Thebes, upon which was inscribed the name of a monarch who lived in 1500 B. C., and which glass was of the same specific gravity as our own crown glass. It is true Pliny mentions that a combination was devised in the reign of Tiberius, which produced a flexible glass; but both the inventor and apparatus were destroyed, in order, it is said, to prevent

the value of copper, silver, and gold from becoming depreciated. There is, however, no evidence whatever that this was the toughening process of De la Bastie, nor does the record in any way detract from the merits of that gentleman as the inventor of an important economic process. The fact remains that the world has now given to it for the first time, in a practical form, an invention by which the brittleness of glass is superseded by an attribute of the most valuable nature — toughness. It is by no means improbable that the old adage, "as brittle as glass," will soon be superseded by a new one — "as tough as glass."—*Popular Science Review.*

EDUCATING THE EDUCATORS.

A WORD TO PARENTS.

A MUCH broader meaning belongs to the word education than is commonly implied. All that is involved in the daily care, in the moral and social training, and in the unconcious molding of children by their parents, is as much a part of education as the direct teaching of the schoolmaster, and the study of text-books. After all that may be accomplished by good schools, the main influences that are to affect the characters of the young are those that pervade their homes. It is therefore with deliberate forethought that we have conducted the MONTHLY on the broad plan of adaptation to the interests of parents as well as of teachers. We do not wish to fill it with discussions that are merely professional. While every number contains articles whose special interest is for the teacher, we intend that no number shall be without a majority of contributions which shall prove attractive to all intelligent heads of families.

As the welfare of their children is the first consideration with parents, we give much space, from time to time, to those general discussions concerning juvenile health and development which are suitable for household reading. To this class belong such articles as, "Conversation at Home a Help to the Teacher," which appeared in our May number, "Ventilation," in the June number, and that entitled "At what Age shall Education Begin?" in the present number. But inasmuch as all

parents are interested in the improved methods of study and teaching which experience continually suggests, we consult their preferences quite as much as those of the teachers themselves, by introducing such contributions as those most excellent ones on the "Teaching of Reading," by Prof. Scott, in the May and June numbers, and as that on "Declamations and Compositions," in the July number. "Both Puzzled," in this issue, belongs also to the class of topics which all who love children find instructive.

In "Things to Talk About" we present regularly the freshest information regarding new discoveries or inventions, and such brief description of processes of manufacture, changes in social or commercial life, etc., as may prove acceptable to those who like to be well informed. To keep abreast of the thought and industry of our time, one must either be a reader of everything, or have access to judicious selections of current knowledge like these.

We also furnish our readers with articles on subjects of very general interest, which yet belong to the department of Education in the best sense—that of enabling adults to increase their stock of intelligent information, and thus carry on to a higher stage that which can never be completed, their own education. We have made a little free to speak of ourselves in this manner, because we wish it to be distinctly understood that the MONTHLY belongs as much to the parents of children as to their teachers. The school and the home are not divided interests, and it is more than desirable that they who have most at stake in the conduct of Education should be kept in close communication and sympathy with the methods and spirit which control the schools. This can only be when parents maintain their familiarity with current educational problems and discussions, and this they can hardly do in any way so satisfactorily as by the regular reading of an educational journal. We shall continue to furnish a publication adapted to this end, and hope for the generous approval of the friends of education everywhere. In co-operating with us we are sure that they will be educating themselves, who are the real educators of the country; for all that contributes to the enlightenment of parents in regard to the development of childhood is a part of the true mental training.

TEACHING MORALITY.

THE extent to which the teacher ought to go in moral instruction is co-extensive with the best interests of the State and the welfare of her citizens. What the State regards as the violation of law, and the obligations she requires her citizens to take, ought, for the protection of the State, to be thoroughly taught in every public school of the State. All men agree that honesty is a cardinal virtue. Many children come to the schools of the State from homes where they are fed on the bread of dishonesty, and are already skillful in petty larceny, and ingenious in the art of concealing their misdemeanors. Others have never been taught the magnitude of the offense of depriving another of what is rightfully his own, without giving in return its true value; and the dangerous consequences of such an act have never been set before them in their true light. Others know that stealing is wrong, and a grievous offense, but are too weak to resist the temptations to appropriate to themselves what seems to them desirable to possess. Honesty, in the sense of manly honor of purpose, of conviction, of opinion, ought to be impressed early upon the pliable heart of every child of the republic. Honesty is everywhere needed, in private and in public life. There can be no confidence, no healthy growth, no permanent existence of a society, a corporation, or a State, without integrity. If this be true, surely the teacher comes far short of his duty who fails to plant and foster the principle of honesty in the hearts of his pupils.

As no one can be honest who is not truthful, the ninth commandment of the decalogue ought also to be impressed upon the heart, and to be made a part of the life of the pupil. The duties which the child owes to parents—as, love, veneration, devotion, gratitude, forbearance, obedience; and again, the duties the parents owe to their child—as, love, support, protection, education, etc.; duties to others—as, forgiveness, benevolence, generosity, gentleness, courtesy; besides duties to the State—as, respect for law, patriotism, refrainment from any business pursuit which violates even the spirit of the law, or disturbs the peace or quiet of citizens in legitimate employment; and, as in courts of justice, the State imposes obligations to a Higher Power upon those who are to be the future citizens and minis-

ters of justice, accountability to that Higher Power, ought to be taught in the popular educational institutions maintained by the State. Every moral principle which is recognized by the civil powers as binding upon her citizens, ought to be lodged by the teacher of the public school in the hearts of the pupils, to be developed into controlling elements of the character and life.

There are other duties, which may be embraced under the head of physical morality, that ought not to be overlooked; viz., cleanliness, temperance, self-service, energy, courage, contempt of false opinion, modesty, obedience to all the laws of health, and all of those qualities which will contribute to make a man more a man in the struggle for life, because they give more of the elements of success. Getting on in the world is a good thing, but it is not the end: the lives of many of the world's greatest benefactors were pronounced failures by the generation in which they lived. I conclude, therefore, that the State requires that morals be taught to the youth in her schools, and that the lessons in morals should be no insignificant part of the course of study, and should be given systematically and regularly during the school-life of the child.

The lessons should not only be systematic, but they should be given regularly, and should cover the whole range of man's duties to himself, to others, to society, and to his country. The means to be used ought mainly to be left to the intelligent and conscientious teacher. Teachers ought to be living examples of morality, spotless in character, and capable of enforcing obedience to every moral precept. They ought, still farther, to be able to present to the mind and the heart the obligations of moral duty so clearly and forcibly that they will control and mold the life, as against the tendencies of human nature and the temptations incident to public and private business employments. If the moral sense cannot be reached by the authority of man, and it can be aroused and strengthened by appeals to the Higher Law, the teacher ought to be allowed this resource, for if good moral habits are thus produced, surely no evil can befall the State from the means used.—*R. W. Stevens, in Western Jour. Ed.*

WE are never rendered so ridiculous by qualities we possess as by the affectation of those we have not.

THINGS TO TALK ABOUT.

WE are threatened with the introduction of a new nerve destroyer or "stimulant," viz., coca, which is the leaf of a South American climbing-plant. The leaves of the coca being dried in the sun, pulverized, and mixed with adulterating powder or ashes, are eaten or chewed to counteract weariness and promote endurance. The effect is indeed wonderful, as, by the use of coca, the Bolivian Indians are enabled to pursue long journeys on foot with almost no other food. Weston lately used a decoction of coca to sustain him in some of his walking feats. The final influence of the drug is to produce nervous exhaustion, loss of appetite, and impaired digestion. Yet it would not be strange if our mania-loving countrymen should learn to dabble in coca chewing, and, from dabbling, go on to systematic self-poisoning.

EXPEDITIONS to the Arctic region have aroused the inquiry, Are the scientific results commensurate with the sacrifices involved? Many brave men have perished and much treasure has been expended in the attempt to reach the North Pole. The results of these achievements are: (1.) A scanty addition of geographical knowledge in regard to uninhabitable wastes. (2.) A confused mass of meteorological and other statistics, gathered during different seasons, by different methods, without relation to the necessities of generalization. (3.) A great increase of that mania for vainglorious exploration which exalts the accidents and belittles the true aim of an expedition. One of the most successful explorers, Karl Weyprecht, has had the sense and courage to admit that all Arctic expeditions, including his own, have thus far been conducted on a wrong principle and at a needless sacrifice. He recommends that stations be established in various points in the far north, and that an uninterrupted series of scientific observations be made at each point, after a common system, for a period long enough to secure data for the discovery of general laws. The phenomena connected with the *aurora borealis*, with the magnetic currents, with the prevailing winds, ocean currents, and storms, with the growth and release of icebergs, with the Arctic *fauna*, with animal life in the frozen regions, etc., if accurately observed upon an extended scale, would supply much that is

missing in our scientific knowledge. But none of these can be thoroughly ascertained by the members of rival expeditions, who are searching for some "great geographical discovery" to report to an admiring world. Several stations, like those proposed by Dr. Weyprecht, might be maintained for two whole years at less cost than that required for a single expedition, and the return would be immeasurably superior.

CIVILIZED man boasts of the discovery and application of scientific laws, but the rude Malay can make a raft which can outsail his racing yachts, and which he must copy if he wishes to lead in the race. At a recent regatta, a craft built on the principle of a Malay proa, and consisting of a deck laid upon two hulls, each of which is a half section of a boat divided lengthwise along the keel, distanced all competitors, including some of the finest yachts in the New York fleet. This "ugly craft" kept the lead, not only before the wind, but on the tack, to the astonishment and disgust of all rivals. It is very easily managed, and accounted far more safe in ordinary seas than boats built on the usual plan.

GLASS, in the shape of a fiber drawn out fine before the blowpipe, is almost perfectly elastic. William Crookes, F. R. S., says that he has kept glass fibers in a permanent state of twist, involving more than a hundred revolutions, and that they always come back to the exact starting-point as marked on a delicate register. We also hear of new methods of preparing glass, one of which makes it flexible while cold, and the other tough, so that it will bear blows of a hammer. It will not do, in this inventive age, to affirm too positively that "glass is brittle," or that any material is to be always distinguished by its more common quality. We imagine that even Pharaoh's heart, if it should fall into the hands of scientific experimenters, would be proclaimed as one of the most yielding substances known. It undoubtedly had a soft side.

THE cultivation of caoutchouc-yielding trees has been begun in British India. The enormous demand for India-rubber has led to the rapid destruction of the wild growths, so that, but for this wise provision, the supply would be quite exhausted in a few years. Caoutchouc is used for the packing of piston-rods in steam engines, for making joints, belting, hose, tubing, and springs of various kinds, for insulating

cables, for water-proof clothing, for bedding, door-mats, combs, surgical and chemical appliances, and many other purposes. The best quality comes from South America, but the English have taken the pains to introduce the India-rubber trees of the New World in the Indian plantations. Such foresight is characteristic of that great commercial nation which never neglects an opportunity to secure a commercial advantage. The probability is that, after a few years' reckless waste in the South American forests, where the hunters fell the trees instead of tapping them, the world will be dependent on India for its supply of this valuable product. There will be a great rise in price, and the British Lion will drive all the rubber trade into this seasonably arranged "corner."

THE PHILOLOGICAL ASSOCIATION.

THE meeting of the Philological Association, on July 17th, 18th, and 19th, was made doubly dull by the intensity of the heat and the mediocrity of the papers. With notable exceptions mediocrity is a euphemism. This association can only rescue its meetings from this uniform sentence by demanding the presentation of all papers, long before the time of meeting, to a competent committee, by whom those which are worthy may be selected to be read. Then, the reading of a paper would be an honor; now, all the trash of ambitious wiseacres is indiscriminately poured into the ears of an unwilling audience. There might be another trouble—the dimensions and power of the "ring" might increase.

Any mention of the Greek conditional sentence aroused the dormant energies of the members. Prof. Goodwin's crude notions on this subject are in imminent danger of being battered to pieces. Their ablest antagonist at this session was Prof. Gildersleeve.

The association appears to be in earnest in making itself a champion of phonetic spelling. We might expect this of schoolmen, but that the very men who are attempting to inject the study of comparative philology and the history of language into our curricula, should be the leaders in an attempt to wipe out of the language all traces of its history,

is a refreshing contradiction. We fear these learned gentlemen are making a self-stultifying attempt to assist at an impossibility. Seriously, has there ever been a nation that has changed its system of spelling? Are not the word-images as essential to the language of an educated man as the sounds? Can these word-images ever be changed by order, or even government statute? And are not the word-images identical with the traditional spelling? Sound and spelling are a growth, and have grown together. What would it cost to reprint our English literature? Many times, certainly, the amount of the national debts of America and England. Phonetic spelling would make it worthless to all but the learned. Our spelling is bad, but we must make the best of it.

The next session will be in Baltimore. D.

MISCELLANY.

A TEACHER FOR "LINDA."—A mother presented herself at one of the Union school-houses half an hour before school opened. She had "Linda" with her. She was a tall woman, forty years old, with a jaw showing great determination, and "Linda" was sixteen, and rather shy and pretty good-looking. The mother inquired, "Do you allow a boy to wink at a girl?" "Why, no!" "I was afraid you did. Linda is as shy as a bird, and if she should come home some night and tell me that she had been winked at, I don't know what I'd do. Now, another thing: Do you have a beau?" "Why—why—" was the stammered reply. "I think you do!" resumed the woman severely. "I know just how it works. When you should be explaining what an archipelago is you are thinking of your Richard, and your mind is way, way off!" "But, madam—" "Never mind any explanations," interrupted the woman. "I want Linda brought up to know joggerfy, figures, writing, and spellography, and if you've got a beau and are spooking to the theater one night, a candy-pull the next, a horse-race the next, and so on, your mind can't be on education. Come, Linda, we'll go to some other school-house."—*Detroit Free Press.*

"SECOND class in grammar, stand up," said the schoolmaster. "'John is a bad boy.' Who does John correspond with?"

"I know," said the little boy at the foot, holding up his hand. "If you mean John Smithers, he corresponds with my sister Susan."

CURRENT PUBLICATIONS.

ARITHMETIC is undergoing a transforming process which makes the presentation of it in our schools sound strangely to those who studied its rules twenty years ago. Although the facts involved remain the same, the method of approaching them is so different that an old-fashioned student regards the modern text-book much as the proverbial cat looks about in a strange garret. We have before us a [1] "MANUAL OF METHODS AND SUGGESTIONS," for the use of teachers, and designed to accompany the author's series of graded arithmetics. Also, [2] "THE SCIENCE OF ARITHMETIC," designed for High and Normal Schools.

The method pursued by Mr. White is to lead the pupil to construct rules from solutions which have been explained to him. Having analyzed a problem, the pupil is required to construct a written process, and when a number of such processes have been completed, he is prepared to write a descriptive statement of them in the form of a concise and clear generalization. The author calls this union of the analytic and inductive methods the "natural method," since it both teaches processes before rules and rules through processes, and ends not only in the solution of problems, but also in imparting the science of numbers. This method has already met the approval of our best teachers, and they will find this volume helpful in their chosen line of effort. Prof. Olney's book is an ambitious work, crammed full of attempts to be fresh and new both in matter and method. Its design is to give a comprehensive and philosophical view of arithmetical principles, and to prepare the way for advanced mathematical studies. The author groups together such operations as are governed by one general principle, however diverse in form. Very few rules are

[1] By E. E. White; Wilson, Hinkle & Co.
[2] By Edward Olney; Sheldon & Co.

given; but the pupil is warned that he must make them for himself, and not fall into slovenly habits of expressing arithmetical principles. The elements of literal notation and the simple algebraic notation and formulæ are introduced, to which are added more information in regard to business problems in discount, etc., than is generally found in school arithmetics.

Students, lecturers, and other workers in the laboratory will welcome the [3] "ELEMENTS OF PHYSICAL MANIPULATION," by Prof. Pickering, of the Massachusetts Institute of Technology. Part II., just issued, contains courses of experimentation upon electricity, heat, engineering, astronomy, and optics. It carries out the plan of Part I., which introduced a new system of teaching physics, that of encouraging original research in the very beginning. This volume has also a series of tables which the scientific student will find very helpful.

Scandinavian literature is not so familiar to American readers as that of the Latin and Saxon races, and the appearance of a Norse Love Story, [4] "THE PILOT AND HIS WIFE," by Jonas Lie, which has been well translated by Mrs. Ole Bull, is an evidence of the popular demand for something less hackneyed and conventional than the "standard novel" of the period. The materials with which this author has to deal, seem, at first sight, particularly unpromising, but they are treated with singular felicity and power, so that the reader becomes deeply interested in the rude scenes of sailor life ashore, and in the fortunes of a hero who has little to recommend him.

[5] "TWO YEARS IN CALIFORNIA" contains an account of the climate, topography, productions, and history of the land of gold. The natural scenery and the agricultural resources of the country have engaged the author's attention, to the exclusion of the mining industries and social life of the State; but she gives a great deal of information that will be sought for in vain in the accounts of many preceding narrators.

[6] "THE HISTORY OF TRANSCENDENTALISM IN NEW ENGLAND," by O. B. Frothingham, is written in a clear style, and

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[3] Hurd & Houghton.
[4] S. C. Griggs & Co.
[5] By Mary Cone; S. C. Griggs & Co.
[6] G. P. Putnam's Sons.

from the point of sympathetic interest, and is likely to entertain those few persons who profess to understand what transcendentalism is.

[7] "THE PHYSICAL BASIS OF IMMORTALITY" is an attempt to find a theory of material structure, force, and modifications that will satisfy the natural longing for an abiding personal identity. Hazy, fanciful, and inconclusive.

[8] "WORDS, THEIR USE AND ABUSE," by Wm. Matthews, LL. D., is much more than a collection of rules and criticisms; it is a series of most entertaining essays upon the relation of language to morality, mental development, social life, and manners, all of which are studded with illustrative anecdotes and happy quotations. The style is in itself attractive, and the nicety of the author's judgment in the use of words is evident in every chapter. We think he is a little inclined to carry his representations of unfortunate styles of expression to the verge of caricature; but there can be no doubt that the faults which he condemns, some of which often escape the notice of educated people even, should be sedulously avoided. There are many practical suggestions in this volume which must prove valuable to all who wish to form an irreproachable conversational style.

[9] In "ELEMENTS OF PSYCHOLOGY," a book designed as a text-book for beginners in metaphysical study, the author has attempted a strictly scientific classification of outline facts. His style is clear and compact, and he has accomplished all that could be legitimately expected within the necessary limitations of his manual.

"GRADED LESSONS IN ENGLISH" AGAIN.

WE gave, in our May number, what we supposed to be a candid notice of Reed and Kellogg's "Graded Lessons in English." It is true, it was brief. But, the book being small, we could not decently give to it the space that a larger and more pretentious volume might have claimed. With our humble effort, however, the authors do not seem to have been pleased. They deemed it necessary to turn upon us, and attempt an answer. Their so-called "strictures" appeared promptly in the June number. As we had no desire to enter upon a discussion for discus-

[7] By Antoinette Brown Blackwell; G. P. Putnam's Sons.
[8] S. C. Griggs & Co.
[9] By Henry N. Day; G. P. Putnam's Sons.

sion's sake, or even for the mere purpose of showing more fully the correctness of our statements, we made no reply. We were perfectly willing the authors should have their "say," even though they made some gratuitous statements, and drew one or two inferences hardly worthy of men of "high respectability." And there we designed to let the matter rest. But, when silence on our part is interpreted as a virtual acknowledgment that the little book is really almost faultless, truth and justice demand that we resume our pen.

We shall first try to notice some of the authors' attempts at defense. We objected to such expressions as "Build sentences," "Build sentences on the following subjects," "Build these verbs into sentences." And what do R. & K. say? Forsooth, that they wrote for children, not for sensitive ears! This is the very reason why we object not merely to the word *build*, but to the use made of it. "To build a sentence" smacks of the house-builder, the mason, the carpenter; in other words, it suggests mechanical routine and mere machine work. "To build a sentence on a given word" is but little less than nonsense; it naturally conveys the idea of laying something down and building upon it, as bricks or blocks are laid up from a given foundation. The authors ask, "Would the Latin *construct* tire less?" We presume not. We did not suppose it would. We should never ourselves think of talking about "constructing or even building a verb or a noun into a sentence." Such a use of words is as far from English and as near to nonsense as "building the letter *a* into a noun." In the name of common sense, why not say, in good, plain, unmistakable English, "Form sentences containing the following verbs:" "Form sentences, each with one of the following subjects:" etc.?

R. & K. cannot see that "to distinguish *between four things*" is not English. They must try to defend it! They attempt to throw dust into their readers' eyes by quoting a number of examples in which the word *between* is correctly used, and then concluding that, if these examples are right, "to distinguish *between four*" is right. But the cases are not parallel, and their conclusion is a *non sequitur*. Much more reasonably might one of their pupils ask why it should be incorrect to speak of "dividing property *between four* sons," if it is correct to speak of "distinguishing *between four* things." Their answer, we infer, would be, "Because we cannot properly say, 'Distinguish among four things;'" which would afford another evidence of the treadmill character of the teachings of the book. The authors could not have said, "Of four things, we have distinguished each from the others." Oh, no! This would have been "straining after the euphony and elegance of the essay." Rather than do this, they chose to be wrong, to say, "We have distinguished between four things;" then insist that they are right. They remind us of Goldsmith's "village master," of whom the poet says,

> "In arguing, too, the parson owned his skill,
> For e'en though vanquished he would argue still!"

But the main objection to our notice seems to be that it was too general; did not enter into particulars sufficiently. This was owing to two things, want of space, and a desire to save the authors' feelings. Some of the errors referred to are so obvious that almost any properly trained school-boy, after being put on the scent, could easily find them; and we supposed that a mere reference to them would suffice. But it seems that we greatly misjudged these authors, for they call for a bill of particulars. "Put any or all of these charges," say they, "into the concrete; point out precisely the *where*, the *what*, and the *why*." Even those errors that we did specify, they could not see. And, so far as they are concerned, we have no expectation of remov-

ing the cataract. But, for others' sakes, we shall make the attempt. We shall verify every "charge" we made, and substantiate every "bald assertion" of which we were guilty. At least we mean to take due space for it, and, if our authors think we have taken too much, they may thank themselves for it.

1. We charged the following with being faulty in construction and punctuation:

"The sentence is our unit. Starting with the simplest, of two words, and bringing in gradually, one after another, all kinds of modifying words, phrases, and clauses, the pupil ascends by the easiest stages possible, to complex and compound sentences."

As to the punctuation of this, we ask why the closing clause, "the pupil ascends," etc., contains a comma. There should be either no comma after *possible*, or else a comma after *ascends* as well as after *possible*. The former would be the preferable punctuation. But, as the words are now punctuated, the object of the verb *ascends* is improperly cut off.

The construction, "the simplest" of *one* thing, namely, of "the sentence," seems to us capable of improvement. Had the authors said, "*Sentences* are our units. Starting with the simplest," *i. e.*, with the simplest of "sentences," the structure in this respect would have been unobjectionable. Besides, they would have avoided a misuse of *the*. The expression "the sentence" properly implies some particular sentence. But no such reference is had. It is true, we can properly say, *e.g.*, "*The horse* is a noble animal," meaning that horses are noble animals. But it is horses as particularized and distinguished from other animals, other objects of the same general class. Sentences, however, are not here regarded as things that belong to a general class, from the rest of which they are intended to be particularized. Hence the impropriety of the article with the singular — "the sentence" — instead of the plural form without the article. Again, the sixth word of this extract — *starting* — seems to refer to the authors, represented by the word *our* just before, or else to the book, represented in the preceding sentence, "These are eminently 'Graded Lessons in English.'" That is to say, as one begins to read the sentence, he naturally supposes that it is either the book or the authors that are meant as "starting with the simplest" sentence, etc. But, before he gets through, he finds he has mistaken the meaning. It is "the pupil" that is really represented as thus "starting," and "*bringing in* gradually, one after another, all kinds of modifying words, phrases, and clauses." How smart the pupil must be to do all this! But, of course, it is not the pupil, but the book, that does this, though the sentence does not say so. If this is correct "sentence-building," we have yet to learn what incorrectness of speech is. English like this might all pass without comment if found among the slipshod effusions of some rural editor; but for such writing to appear in the very preface of a little book that professes to give "all the grammatical principles needed for the complete understanding and *construction of a correct* English sentence," is really too bad; it is enough to condemn the volume as a text-book for beginners even in "English sentence-building."

2. "The definitions generally, though brief, are very incorrect." We give a few samples: "A sentence is *the expression* of a thought in words." What, then, is "utterance"? Is not a sentence rather *a group of words* that expresses a thought? "A noun is the name of *anything*." *Cork* is a noun, not because it is "*the* name of *any*thing," but because it is "a name," or "the name of *some*thing." "A preposition is a word used to show the relation between the principal word of a phrase and the word which the phrase modifies." But suppose the phrase does not modify any word, as in the sentence, "To err is human." (R. & K. call *to* here a preposi-

tion. See p. 66.) Or, suppose it does, as in the sentence, "Albany is situated on the Hudson." What is "the relation" between the word *Hudson* and the word *situated*, as "shown" here by *on?* We confess that to us this relation appears to be exceedingly shadowy and unsubstantial; and this definition of a preposition is simply language without meaning,—literally, nonsensical. "Number is that modification of a noun or [a] pronoun which shows that it names one thing or more than one." If number is a "modification," then nouns and pronouns have *two* of these "modifications," for they have two numbers, the singular and the plural. Moreover, what is the modification "which shows" that the following words, for example, name one thing or more than one? *Sheep, who; alms, elms; pen, men; vine, swine;* a *sail*, ten *sail?* The fact is that, while nouns and pronouns generally change their form in some way in passing from one number to another, number itself is in no sense a "modification." It is something that lies in the meaning rather than in the form of words. And the sooner makers of grammatical text-books get hold of this idea, the better will it be for the pupil. But we must pass on, though many other definitions are quite as faulty.

3. "The arrangement might be improved." For instance, it would be better to inform the pupil what a "proper or individual name" is, before giving the rule for writing such a name; better than to give a rule, then wait until he has gone over seventy or more pages, before explaining to him what the thing is to which the rule refers. (Compare pp. 23, 95.) At least, so it seems to us. He might infer that "improper or family names" are not included in the rule. The learner is told, p. 49, that conjunctions "may connect *clauses*," and he is left to infer that co-ordinate and independent members of sentences are "clauses." (Compare Hart's *Gram. and Anal.*, p. 176.) On p. 75, a "complex sentence" is defined before clauses are defined. That is to say, the learner is taught that a certain compound consists of chalk and cheese, before he has learned what chalk and cheese are. Is this what the authors call the "inductive" method of teaching?

4. "The number of lessons might be greatly reduced." For example, such exercises as may be found on pp. 17, 18, 20, 24, 44, 79, and elsewhere, consisting in the matching of some unknown word or phrase to some given word or words, might be omitted, and the book be all the better for the omission. These exercises may divert a certain class of minds; so will almost any other puzzles, for they are mere verbal puzzles. They afford no more instruction in composition or in the use of language than does the matching of geographical blocks, or the gauging of the capacity of grammatical blockheads. They do nothing whatever toward really enlarging a pupil's vocabulary, or making him ready or skillful in the use of language. They tax his brain for unprofitable ideas, not for language; and, as soon as the necessary idea is reached, the word comes as a matter of course, and goes as it came, without producing any good result. But take exercises like the first two-thirds of Lesson 33, p. 45, where certain words or phrases are required to be translated into others, retaining the given ideas, and great profit may be derived therefrom. We shall never forget how utterly valueless and often irksome we found, in our early years, this mere matching of words and phrases to other words and phrases, as is required on many of the pages of this book; and we always pity the poor pupils who are required to go through such stupid exercises under the delusion that they are thereby making advances in the knowledge or use of language.

5. "The treatment of the infinitive, making *to* a preposition, is absurd." If any proof of this is necessary, we refer to the definition of a preposition, and to the fact that the forms *to be, to have, to have come*, are perhaps as often used as subjects

and objects of verbs as otherwise, in all which cases *to* has no more the force of a preposition than the termination *re* in the Latin *amare* or *docere*.

6. "The treatment of the subjunctive is false." R. & K. give the verb *to be* two tenses in this "mode," but all other verbs only one; and these they misname. Perhaps, however, this is about as satisfactory as the treatment of the subjunctive found in grammars generally.

7. "The misuse of the definite article is glaring." An instance of this has already been noticed in the phrasing, "The sentence is our unit." The following are additional examples: "Correct all mistakes in spelling, and in the use of *the* capital letter and the period;" p. 17. "*The* [An] adjective or *the* [an] adverb clause, when it does not closely follow the word modified, is generally set off by *the* [a] comma;" p. 76. Such is these authors' partiality for this little word that they must needs misquote Shakespeare, p. 76:

"Uneasy lies the head that wears *the* crown."

8. "Several of the examples of 'errors to be corrected' are so much worthless rubbish, because never made by children." Examples: "Which is the *longer* of the rivers of America?" p. 119. "*A* ivory ball;" p. 86. "*An* brickbat;" p. 33. "A *wooden pretty* bowl stood on the table;" p. 40. "*Whom* did you say that it was?" p. 142. School children never make these mistakes. They are not liable to make them. Why, then, put such examples before them for correction?

9. "The few rules of syntax that are thrown in here and there are so stated, and so briefly illustrated, as to be of but little or no practical value." As samples of these rules, we give the following: "Place adverbs where there can be no doubt as to the words they qualify;" p. 54. "Adjectives must not be used for adverbs;" p. 55. "Care must be taken to select the right preposition;" p. 57. "Do not use adjectives and adverbs extravagantly;" p. 119. "When a verb has two or more subjects connected by *and*, it must agree with them in the plural. A similar rule applies to the agreement of *the* pronoun;" p. 134. According to this, sentences like "William *and* not Harry *were* present," "A great hue *and* cry *were* raised," "Two dollars *and* fifty cents *were* all that John had left," ought to be correct. And, for all that the book says to the contrary, the pupil must so regard them.

10. "The punctuation is not faultless." In proof of this, we give: 1. Examples with one or more unnecessary commas: "The teacher is put in possession of what seems to us, the most natural and easy method of developing, inductively, every topic that arises;" p. 4. "If the voice, thus produced, comes out through the mouth, held well open, a class of sounds is formed, which we call vowel sounds;" p. 11. "You may learn from this, why such modifiers are grouped into one class;" p. 38. "Phrases of the form illustrated in this diagram, are the most common;" p. 42. "A phrase modifying the subject, is equivalent to an adjective, and, frequently, may be changed into one;" p. 42. 2. Examples with the comma improperly omitted: "Add such names to these nouns and then expand the expressions into complete sentences;" p. 72. "Expand this phrase into an equivalent clause and give me the entire sentence;" p. 78. "The house which was built upon the sand, fell;" p. 88. In this last example, if the adjective clause is designed to be restrictive, the error lies in using *which* for *that*. The sentence should read either, "The house that was built upon the sand fell;" or else "The house, which was built upon the sand, fell." This misuse of *which* for *that* is no uncommon thing with Messrs. R. & K. The following are a few instances: "Correct any expression *which* does not make good sense, or *which* asserts something not strictly true;" p. 17. "Animals

which have a backbone are called vertebrates;" p. 76. "We are about to show you that they are often used as the foundation of a structure, *which* is completed by adding other parts;" p. 27. "A thing *which* is beautiful, is a joy forever;" p. 88. In these last two instances the punctuation is also incorrect. The authors mean, "The foundation of a structure *that* is completed by adding other parts," and "A thing *that* is beautiful is a joy forever." (Compare, in reference to punctuation, the sentence, p. 76, "He who will not be ruled by the rudder must be ruled by the rock;" which is correct.)

These, the reader will understand, are only specimens of the imperfections of these "Graded Lessons." If we have abstained from giving, in every instance, the precise *what* and *why*, it is because we do not care to presume that he lacks the intelligence or ability to discover for himself what we have refrained from pointing out.

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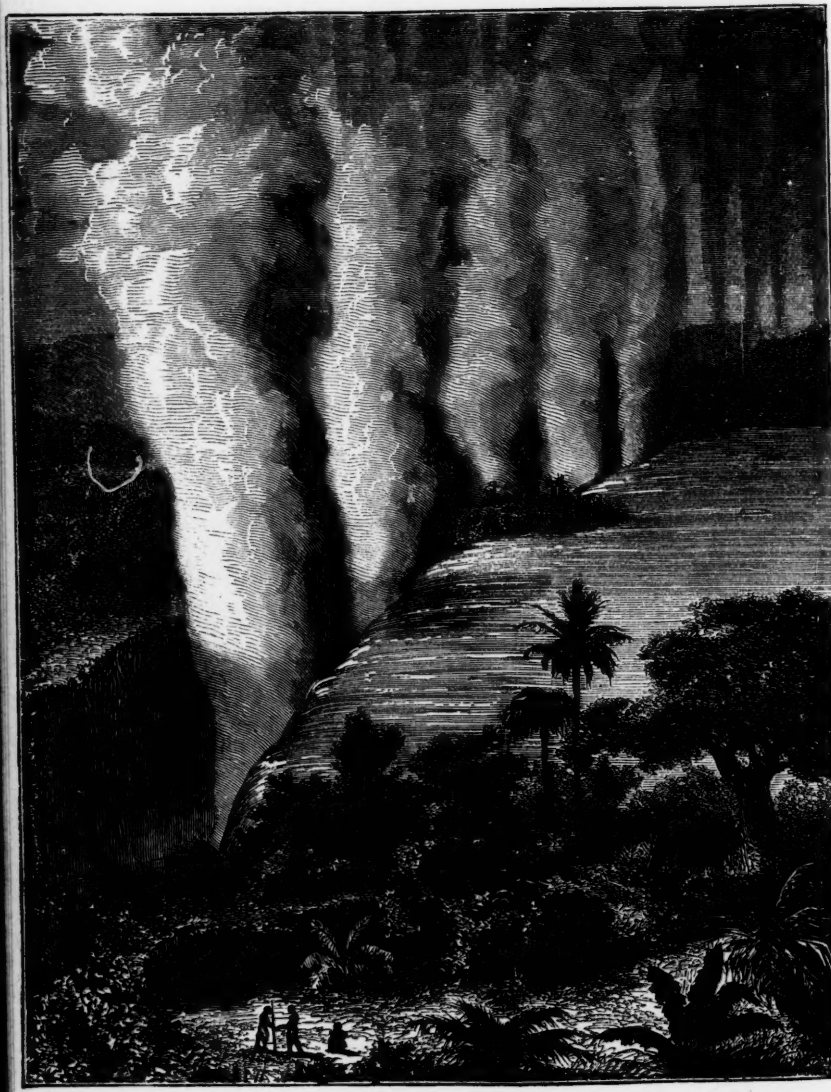

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